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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,641

06/14/2006

Prasenjit Sen

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LADAS & PARRY LLP  
26 WEST 61ST STREET  
NEW YORK, NY 10023

EXAMINER

YANG, JIE

ART UNIT

PAPER NUMBER

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/562,641	<b>Applicant(s)</b> SEN ET AL.	
	<b>Examiner</b> JIE YANG	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10, 12-19 and 21 is/are pending in the application.
- 4a) Of the above claim(s) 12-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-10 and 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 December 2005 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/24/2006</u> .   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

Applicant's election with traverse of Group I—Claims 1-10 and 21, in the reply filed on 9/5/2008 is acknowledged. The traversal is on that the Applicants believe that: the issue here is not whether the feature of the nanoparticles is known in the art but whether the apparatus can be used to carry out the method, it is applicants' position that a single invention is claimed in this application. In response, as pointed out in the previous "Requirement for Restriction/election" marked 7/9/2008, groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features. In another way, group I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. In this case the process for manufacturing nanoparticles as claimed can be practiced by another and materially different apparatus, for example by a twin wire electrodes arc apparatus. The requirement is still deemed proper and is therefore made FINAL.

Claims 1-10, and 12-19 are amended from original claims; claims 11 and 20 are cancelled; claims 12-19 are withdrawn from consideration as being directed to a non-elected group; claim 21 is added as new claim; and Claims 1-10 and 21 are pending for examination.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al (JP 04-350107 with machine English translation, thereafter JP'107) in view of Akiyoshi (JP 02-166202, thereafter JP'202).

Regarding claims 1, 2, and 10, JP'107 teaches a process of producing fine powder by generating spark discharge with two metal electrodes (wire and disk) in liquid nitrogen (Abstract, Fig.1, and table 1 of JP'107), which reads on the producing nanoparticles by controlled electro-explosion of metallic wire in a suitable medium as recited in the instant claim 1. JP'107 teaches that a DC 50V power is applied between titanium board (disk) and the titanium wire rode (Paragraphs [0011]-[0015] of JP'107), which reads on applying a voltage of greater than 12V on a first electrode in the form of plate and a second electrode in the form of a wire as recited in the step (i) of the instant claim 1. JP'107 teaches that the spark discharge breaks out among electrodes in the liquid nitrogen to generate granular materials which adhered to an inner wall or the bottom in

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ethanol were collected (Paragraphs [0016] and [0019] of JP'107), which reads on the exploding and collecting processes in steps (ii) and (iii) of the instant claim 1. JP'107 does not specify the powder is metallic material. JP'202 teaches manufacturing uniform quality metal particles (0.1 -0.01 $\mu$ m in diameter) with arc discharging in water (Abstract of JP'202). JP'202 teaches generating the similar nano scale particles with the similar two metal electrodes discharging in the same liquid medium (water) as recited in the instant invention. Therefore, it would have been obvious to one skilled in the art to manufacture metallic nanoparticles in the process of JP'107 by using water as liquid medium as demonstrated by JP'202 because JP'202 teaches the metal particles having small diameter without any uneven structure (Abstract of JP'202). The liquid medium (water) as taught by JP'202 reads on the limitations of the collecting medium (claim 2) and selecting medium from water and butanol (claim 10).

Regarding claim 3, JP'107 teaches variable voltage direct-current power supply (paragraph [0012] and Fig. 1 of JP'107), which reads on the process of altering one or more of the applied voltage, explosion current density and wire diameter as recited in the instant claim. Because JP'107 teaches the similar

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electro-discharging method in liquid medium for the similar nanoparticles as recited in the instant invention, the variable voltage would inherently lead to modify the size of the nanoparticles with expected success. MPEP 2112 III&IV.

Regarding claim 4, JP'107 teaches one of the electrodes in the form of a wire rode and intermittently generating spark discharge (Fig.1, paragraphs [0014]-[0017] of JP'107), which reads on the limitation of the instant claim.

Regarding claim 5, JP'107 teaches applying 50V DC voltage between electrodes, which is close to the high limit of the range, 48V DC voltage as recited in the instant claim. It is a prima case of obviousness. MPEP 2144.05 I.

Regarding claims 7-9, JP'107 teaches the suitable metals are transition metal, or aluminum (paragraphs [0007]-[0009] of JP'107), which are the same metals as selected in the instant claims 8 and 9. Because JP'107 teaches applying the same transition metal, or aluminum as electrodes, the limitation of electrode having at least a conductivity  $3.5 \times 10^7 \text{ (ohm.m)}^{-1}$  as recited in the instant claim 7 would inherently be expected. MPEP 2112 III&IV.

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Claims 5, 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP'107 in view of JP'202 as applied to claims 1-5 and 7-10, and further in view of Ryzkov (US 6,884,405 B2, thereafter US'405).

Regarding claim 5 and 21, JP'107 in view of JP'202 does not specify the voltage in the range of 12V-48V (claim 5) or more specifically, 36V (claim 21). US'405 teaches arc-discharging technique for fullerene/nanotubes application (abstract of US'405). US'405 teaches that graphite and metal electrodes discharging at the voltage 18-65V or more specifically 24-36V to produce electric arc (claims 5-7 and Col.24, lines 17-49 of US'405), which is within the range of 12V-48V as recited in claim 5 and includes the 36V as recited in the instant claim 21. Therefore, it would have been obvious to one skilled in the art to pick a proper DC voltage such as claimed as taught by US'405 in the process JP'107 in view of JP'202 in order to perform auto-regulated regime of the electric-current arc-discharge (Abstract of US'405).

Regarding claim 6, JP'107 in view of JP'202 does not specify the cross-section of the second electrode is in the range of  $0.4411 \times 10^{-5} \text{cm}^2$  -  $1.7721 \times 10^{-5} \text{cm}^2$  in order to carry current in the range  $0.96 \times 10^6 \text{A/m}^2$  -  $77.6 \times 10^6 \text{A/m}^2$ . However, the cross-section of the electrode is recognized as a result-effective variable in

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terms of carrying a current density. This position is evidenced by US'405. US'405 teaches an arc-discharging technique for the fullerene/nanotubes application (abstract of US'405). US'405 teaches the graphite and metal electrodes with variable cross section in order to carry desired arc current 100 to 400A/cm<sup>2</sup>, which overlaps the current density level as recited in the instant claim. US'405 teaches the same level voltage 24-36V (Col.24, lines 17-22 and claim 7 of US'405) as recited in the instant invention. Therefore, it would have been obvious to one skilled in the art to pick a proper cross-section of the metal wire according different materials as demonstrated by US'405 in the process JP'107 in view of JP'202 in order to obtain the desired current density. MPEP 2144.05 II.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jie Yang whose telephone number is 571-2701884. The examiner can normally be reached on IFP.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-2721244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/  
Supervisory  
Examiner, Art Unit 1793

Patent

JY